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(54) Title of the Invention: PRINTING DEVICE WITH INKJET PRINTER

20 (57) [Abstract]

[Purpose] The printing accuracy is increased by eliminating the influence of wind. Further, the printing sharpness is enhanced.

[Structure] An inkjet printer by which printing is performed on a material 6 to be printed. A hermetically-closed printing chamber 7 in which the material to be printed and at least a nozzle 1 of the inkjet printer are contained so that printing is conducted. A decompression device 8 by which the pressure in the hermetically-closed printing chamber 7 is reduced. A printing device is formed by being provided with them. It is difficult to generate wind in the hermetically-closed printing chamber 7 in which a reduced pressure state is maintained and air is thin, whereby the possibility of being
25 influenced by wind is eliminated. Further, the evaporation speed of a diluent of ink is accelerated in the hermetically-closed printing chamber 7 in which a reduced pressure state is maintained, so that the drying of the ink can be accelerated and the blur of the
30

ink can be prevented.

[Scope of Claim]

[Claim 1]

- 5 A printing device with an inkjet printer characterized by comprising:
an inkjet printer by which printing is performed on a material to be printed;
a hermetically-closed printing chamber in which the material to be printed and
at least a nozzle of the inkjet printer are contained so that printing is conducted; and
a decompression device by which a pressure in the hermetically-closed printing
chamber is reduced.

10 [Detailed Description of the Invention]

[0001]

[Field of Industrial Application]

The present invention relates to a printing device with an inkjet printer for a
printed wiring board or the like.

15 [Field of Industrial Application]

[0002]

[Conventional Art]

- It is conventionally common to perform screen printing when surfaces of
materials to be printed, such as printed wiring boards or electronic components, are
20 subjected to printing of product numbers, lot numbers, symbols of companies, care
marks, or the like or when these surfaces are subjected to printing with resists,
conductive pastes, nuclei of electroless plating, or the like. However, in the case of
screen printing, plate making of a screen is needed. In the case of manufacture of a
wide variety of products in small quantities, such a plate making causes problems in that
25 working efficiency is impaired, costs are increased, and the like.

[0003]

- Thus, printing on a surface of a material to be printed using an inkjet printer is
suggested by the applicant. With the use of an inkjet printer, given letters or the like in
accordance with data input to a computer can be printed without the need for a plate.
30 In addition, printing is performed by the inkjet printer in such a manner that ink
particles fly from a nozzle and adhere to a surface of a material to be printed; therefore,
unlike by a wire dot printer, the surface of the material to be printed is not damaged.

Moreover, since printing can be performed with no difficulty even when the surface has some roughness, the ink jet printer is suitable for a device by which printing is performed on a material to be printed, such as a printed wiring board with a surface over which a circuit is formed.

5 [0004]

In the case where printing is performed with an inkjet printer, a nozzle of the inkjet printer needs to scan across the entire surface of a material to be printed by moving a material to be printed at a high speed relatively with respect to the nozzle of the inkjet printer.

10 [0005]

[Problems to be Solved by the Invention]

However, when the material to be printed is moved at a high speed as described above, wind is generated by the moving influences a flying direction of ink particles which fly from the nozzle to the material to be printed; therefore, there has been a possibility that precise printing cannot be performed. Further, ink whose viscosity is decreased by a diluent is used in order that particles of the ink are ejected from the inkjet printer. Accordingly, after the particles adhere to the surface of the material to be printed, the ink penetrates the material to be printed due to the diluent, so that a blur is generated. Thus, there has been also a problem in that the printing sharpness was reduced.

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[0006]

The present invention is made in view of the foregoing, and its purpose is to provide a printing device with an inkjet printer by which printing accuracy can be increased and printing sharpness can also be enhanced by eliminating the influence of wind.

25

[0007]

[Means for Solving the Problems]

A printing device with an inkjet printer according to the present invention, characterized by including an inkjet printer A by which printing is performed on a material 6 to be printed, a hermetically-closed printing chamber 7 in which the material 6 to be printed and at least nozzle 1 of the inkjet printer A are contained so that printing is conducted, and a decompression device 8 by which the pressure in the

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hermetically-closed printing chamber 7 is reduced.

[0008]

[Operation]

Since the material 6 to be printed and at least the nozzle 1 of the inkjet printer
5 A are contained in the hermetically-closed printing chamber 7 and printing is carried out
while the pressure in the hermetically-closed printing chamber 7 is reduced by the
decompression device 8, it is difficult to generate wind in the hermetically-closed
printing chamber 7 in which a reduced pressure state is maintained and air is thin even
when the material 6 to be printed is moved at a high speed, whereby the possibility of
10 being influenced by wind is eliminated. Further, the evaporation speed of a diluent of
ink is accelerated in the hermetically-closed printing chamber 7 in which the reduced
pressure state is maintained, so that the drying of the ink can be accelerated and the blur
of the ink can be prevented.

[0009]

15 [Example]

This invention will be described below using an example. As an inkjet printer,
a given one such as a charge-deflection type inkjet printer can be used. In Particular,
in the present invention, it is preferable to use an inkjet printer, in which a large number
(there is a case where the largest number is a thousand) of the nozzles 1 are arranged in
20 parallel in line and contained in a casing 11a so that a multi-nozzle type head A is
formed as in FIG. 2(a). The head A of this multi-nozzle type inkjet printer is disposed
over a feeder 18 serving as a conveyance table. The feeder 18 is formed using a
conveyer belt 20 that is driven with a motor 19 such as a pulse motor. The head A of
the multi-nozzle type inkjet printer is disposed so that a direction parallel that is to the
25 nozzles 1 is perpendicular to the running direction of the conveyer belt 20. Although a
gutter 5 is disposed obliquely downward the head A, the gutter 5 may be contained in
the casing 11 of the head A in an example of FIG. 2(a).

[0010]

FIG. 2(b) illustrates a basic structure of a charge-deflection type inkjet printer,
30 and only one of the nozzles 1 contained in the head A is illustrated. In FIG. 2(b),
reference numeral 12 is an oscillation electrode such as a piezoelectric element, which
oscillates the nozzle 1, reference numeral 3 is a charge electrode, reference numeral 4 is

a deflection electrode, and the charge electrode 3 and the deflection electrode 4 are contained in the casing 11 of the head A. The charge electrode 3 is provided so as to correspond to each of a large number of the nozzles 1 arranged in parallel in the head A, and this charge electrode 3 can be formed also as a pin electrode. Each of the nozzles 1 arranged in parallel in the head A is connected to an ink reservoir 13, and ink 14 is supplied from the ink reservoir 13 to the nozzle 1. When the ink 14 is supplied to the nozzle 1 in this, the ink is changed into ink particles 2 by the operation of the oscillation electrode 12 and is ejected continuously from the nozzle 1. The ink particles 2 ejected continuously from the nozzle 1 are selectively charged in the time of passing through the charge electrode 3. In other words, on/off of the charge electrode 3 is controlled. The ink particles 2 passing through the charge electrode 3 are charged when the charge electrode 3 is made in on-state, and the ink particles 2 passing through the charge electrode 3 are not charged when the charge electrode 3 is made in off-state; thus, the ink particles 2 are selectively charged. Then, when each ink particle 2 passes through the deflection electrode 4, a flying trajectory of the charged ink particle 2 is deflected, and the ink particle 2 that is not charged is not deflected and travels in a straight line. The ink particle 2 whose flying trajectory is deflected is captured by the gutter 5, is collected in the ink reservoir 13, and is reused. The ink particle that is not charged and travels in a straight line is not captured by the gutter 5 and reaches the material 6 to be printed, such as a printed wiring board.

[0011]

The head A in which the nozzles 1 of the inkjet printer are contained and the feeder 18 are disposed in the hermetically-closed printing chamber 7 that is formed using a hermetically-closed box or the like, as illustrated in FIG. 1. Moreover, the decompression device 8 formed using a vacuum pump, a plate fan, and the like is connected to the hermetically-closed printing chamber 7. An inlet 7a and an outlet 7b, which can be closed in order to keep air tight, are provided in a front portion and a back portion of the hermetically-closed printing chamber 7, respectively. The inlet 7a is opened so that the material 6 to be printed on which printing is performed, such as a printed wiring board, is supplied and set in the feeder 18. The outlet 7b is opened so that the material 6 to be printed when printing is finished can be extracted from the feeder 18.

[0012]

Further, as the ink 14 used in the inkjet printer, solvent dilution type ink such as thermosetting resin ink or UV-curable resin ink is general, and the ink 14 is diluted in the range of 30 to 90 wt% using an organic solvent such as MEK, ethyl alcohol, methyl alcohol, butanol, or acetone as a solvent. As a main resin of the ink 14, a thermosetting resin such as an epoxy resin, an acrylate resin, a phenol resin, a urea resin, a melamine resin, or a polyimide resin is used. In addition, it is possible to use a thermoplastic resin such as a vinyl acetate resin or an acrylic resin. The resin is mixed in the range of 5 to 50 wt%. As another solid content, a colorant such as a pigment or a dye, a filler, or the like can be mixed in the range of 5 to 20 wt%. Further, a charge imparting agent can be added at several parts by weight as necessary.

[0013]

Therefore, when a surface of the material 6 to be printed, such as a printed wiring board, is subjected to printing, the material 6 to be printed is placed and set, horizontally over the conveyer belt 20 of the feeder 18 as a table, as in FIG. 2(a), and then, the pressure in the hermetically-closed printing chamber 7 is reduced by the decompression device 8. The degree of decompression is set as appropriate in accordance with the performance, decompression start time, energy requirement, required printing quality, and the like of the decompression device 8, and the range of 750 mmHg to 50 mmHg is preferable. In a charge-deflection type inkjet printer, when the electrification voltage or deflection voltage is high, a state such as a spark is generated by the decompression; thus, the degree of decompression needs to be set on the basis of this fact.

[0014]

Then, the material 6 to be printed is passed under the head A of the multi-nozzle type inkjet printer at a certain speed by running the conveyer belt 20 at a certain speed with the motor 19. At this time, the ink particles 2 are continuously ejected from each of all of the large number of nozzles 1 arranged in parallel in the head A. Part of the ink particles 2 among the ink particles 2 ejected from each of the nozzles 1 is charged by controlling the charge electrode 3 to be in an on-state and the flying trajectory thereof is deflected in the deflection electrode 4, whereby the part of

the ink particles 2 is captured by the gutter 5. Further, the other ink particles 2 are not charged when the charge electrode 3 is controlled to be an off-state and travel in a straight line without influence of the deflection electrode 4. Accordingly, these ink particles 2 that travel in a straight line reach the surface of the material 6 to be printed.

5 In such a manner, on/off of the charge electrode 3 of each of the nozzles 1 is controlled so that the ink particles 2 ejected from each of the nozzles 1 are selectively charged; therefore, the ink particles 2 which reach the material 6 to be printed can be selected and positions of the ink particles 2 which adhere to the material 6 to be printed can be selected. The ink particles 2 selectively adhere to the material 6 to be printed in such a
10 manner while the material 6 to be printed is moved with respect to the head A by the feeder 18; thus, desired letters, marks, or patterns can be printed. That is, as illustrated in FIGS. 3(a) to (f), the ink particles 2 ejected from each of the nozzles 1 of the head A selectively adhere to the surface of the material 6 to be printed while the material 6 to be printed is moved at a certain speed in the direction of an arrow, so that desired letters,
15 marks, or patterns can be printed. Note it is preferable that the ink-ejection diameter of each of the nozzles 1 be set to 30 to 150 μm so that the size of an ink dot is 0.1 to 0.3 mm. Further, the oscillation frequency is preferably set to 20 to 200 kHz.
[0015]

When printing is performed with the inkjet printer as described above, this
20 printing is performed in the hermetically-closed printing chamber 7, specifically, while the pressure in the hermetically-closed printing chamber 7 is reduced by the decompression device 8, so that it is difficult to generate wind in the hermetically-closed air chamber 4 in which a reduced pressure is maintained and air is thin even when the material 6 to be printed is moved at a high speed by the feeder 18;
25 accordingly, printing can be conducted without being influenced by wind. Therefore, the flying direction of the ink particles 2 which fly from the nozzles 1 in the head A to the material 6 to be printed is not influenced by wind, so that the ink particles 2 reach the material 6 to be printed in desired correct positions; thus, highly accurate printing can be performed. In the hermetically-closed printing chamber 7 in which a reduced
30 pressure state is maintained, the evaporation speed of the diluent of the ink 14 is accelerated, so that drying of the ink 14 adhered to the surface of the material 6 to be

printed can be accelerated. Therefore, the ink 14 can be prevented from blurring on the material 6 to be printed due to penetration of the diluent and printing sharpness can be increased.

[0016]

5 In the above example of FIG. 2(a), print width measurement (arrangement width measurement of the nozzles 1) of the head A of the multi-nozzle type inkjet printer is made larger than the width measurement of the material 6 to be printed, so that printing can be performed on the material 6 to be printed by passing the material 6 to be printed under the head A only once. However, in the case where the print width
10 measurement of the head A is smaller than the width measurement of the material 6 to be printed, the material 6 to be printed is made to pass under the head A again after the head A is shifted to a width direction that is perpendicular to a feed direction of the material 6 to be printed with the feeder 18, whereby printing can be performed. For example, in the case where the width measurement of the material 6 to be printed is
15 about 600 mm and the print width of the head A is 50 mm, the head A is shifted 12 times orthogonally with respect to the feed direction of the material 6 to be printed so that the material 6 to be printed reciprocates under the head A; thus, the entire surface of the material 6 to be printed can be subjected to printing. In the case where printing is conducted while the head A is shifted orthogonally with respect to the feed direction
20 of the material 6 to be printed, the total distance of moving of the material 6 to be printed which passes under the head A is extremely long. For example, when the length of one of the feed directions of the material to be printed is 600 mm, printing is performed by shifting the head A 12 times as described above, so that the total distance of moving of the material 6 to be printed which passes under the head A is $600 \text{ mm} \times 12$
25 $= 7200 \text{ mm}$. Therefore, in this case, moving speed of the material 6 to be printed needs to be set to about 100 m per minute, which is high speed, in order to increase the printing productivity. The pressure in the hermetically-closed printing chamber 7 is reduced as described above and it is difficult to generate wind, so that the influence of wind can be prevented even when the material 6 to be printed is moved at a high speed
30 in such a manner.

[0017]

In the example of FIG. 2(a), printing is performed in such a manner that the material 6 to be printed is moved with the feeder 18 and the material 6 to be printed is moved relatively with respect to the nozzles 1 of the inkjet printer; however, the nozzles 1 may be moved. Moreover, since the pressure in the hermetically-closed printing chamber 7 is reduced, it is easy to drop the ink 14 from the nozzles 1 and the load is reduced, which is preferable. On the other hand, it is difficult to keep the ink 14 in the nozzles 1. Therefore, an inkjet printer in which the ink 14 is constantly ejected from the nozzles 1 as illustrated in FIG. 2(b) is preferable. In this case, the pressure in the route for collecting the ink 14 from the gutter 5 to the ink reservoir 13 needs to be reduced at a degree of vacuum that is higher than that in the hermetically-closed printing chamber 7.

[0018]

Note that when printing is conducted in the hermetically-closed printing chamber 7 in which a reduced pressure state is maintained as described above, the evaporation speed of the diluent of the ink 14 is accelerated, so that drying of the ink 14 is accelerated; therefore, the ink 14 can be prevented from blurring on the material 6 to be printed due to penetration of the diluent. Accordingly, the selection range of a solvent used as the diluent can be broadened and a solvent which is safer and which causes less environmental pollution can be selected. Further, in the present invention, a blur is prevented as described above and the shape of an ink dot that adheres to the material 6 to be printed is a perfect circle, whereby a stable image can be printed. Furthermore, printing with a thick ink layer is easily performed by over-printing of ink dots. Moreover, since printing is carried out in the hermetically-closed printing chamber 7 in which a reduced pressure state is maintained, a print base of the material 6 to be printed is stabilized; therefore, the material 6 to be printed whose surface state or shape is patchy can be subjected to stable printing. Further, fine small ink particles can be prevented from scattering and adhering to the surface of the material 6 to be printed as satellites, and even when the ejection speed of the ink particles 2 from the nozzles 1 is made low, deflection is performed well. Thus, in the case where printing is performed by which the ink particles 2 overlap, scattering over the surface of the material 6 to be printed caused by collision of the ink particles 2 can be prevented, so that a printed surface can be made clearly.

[0019]

[Effect of the Invention]

The present invention includes an inkjet printer by which printing is performed on a material to be printed, a hermetically-closed printing chamber in which the material
 5 to be printed and at least a nozzle of the inkjet printer are contained so that printing is conducted, and a decompression device by which a pressure in the hermetically-closed printing chamber is reduced, as described above. Therefore, it is difficult to generate wind in the hermetically-closed printing chamber in which a reduced pressure state is maintained and air is thin even when the material to be printed is moved at a high speed,
 10 so that printing can be conducted without being influenced by wind and printing accuracy can be increased. Further, in the hermetically-closed printing chamber in which a reduced pressure state is maintained, the evaporation speed of the diluent of ink is accelerated, so that the drying of the ink can be accelerated and the blur of the ink can be prevented; accordingly, printing can be sharply conducted.

15 [Brief Description of the Drawings]

[FIG. 1] FIG. 1 is a schematic cross-sectional view of one example of the present invention.

[FIG. 2] FIG. 2 illustrates one example of the present invention, and (a) is a perspective view of a part and (b) is a cross-sectional view of a head of a multi-nozzle type inkjet
 20 printer.

[FIG. 3] FIG. 3 illustrates a process in which printing is conducted by a multi-nozzle type inkjet printer, and (a) to (f) are schematic plan views of a part.

[Explanation of Reference]

- | | |
|------|--------------------------------------|
| 1 | nozzle |
| 25 2 | material to be printed |
| 7 | hermetically-closed printing chamber |
| 8 | decompression device |

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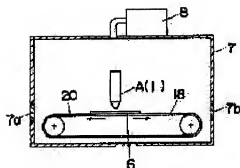
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(54) PRINTING DEVICE DUE TO INK JET PRINTER

(57)Abstract:

PURPOSE: To enhance printing accuracy and printing sharpness by eliminating the effect of a wind.

CONSTITUTION: A printing device is constituted of an ink jet printer applying printing to a material 6 to be printed, a hermetically closed printing chamber 7 receiving the material to be printed and at least the nozzle 1 of the ink jet printer to perform printing and a vacuum device 8 reducing the pressure in the hermetically closed printing chamber 7. A wind is hard to be generated in the hermetically closed printing chamber 7 held to a thin air vacuum state and the possibility receiving the effect of a wind is eliminated. The evaporation speed of the diluent of ink is accelerated in the hermetically closed printing chamber 7 held to a vacuum state to make it possible to accelerate the drying of the ink and the blur of the ink can be prevented.



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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Industrial Application]This invention relates to the printer by the ink jet printer to a printed wired board etc.

[0002]

[Description of the Prior Art]On the surface of printed matter, such as a printed wired board and electronic parts, product number and a lot number, In printing a corporate emblem, a care mark, etc. or printing resist, conductive paste, the core of electroless deposition, etc. on these surfaces, it is common that screen-stencil performs conventionally. However, in screen-stencil, the platemaking of a screen is required, and when such platemaking is performed also in the case of small-quantity multiproduct production, there is a problem of working efficiency worsening or becoming a high cost.

[0003]Then, printing by printing on the surface of printed matter using an ink jet printer is proposed by these people. According to the ink jet printer, it is what does not need to use a version and can print by arbitrary Hitoshi Monju according to the input data to the computer, And since an ink jet printer is what prints by flying the surface of printed matter and making ink particles adhere from a nozzle, Since it can print convenient even if a shock is not given to the surface of printed matter like a stylus printer and some unevenness is shown in the surface, it is the optimal as a device printed to printed matter, such as a printed wired board in which the circuit was formed on the surface.

[0004]When printing with an ink jet printer, it is necessary to make a nozzle scan all over printed matter by making it run printed matter at high speed, and moving it relatively, to the nozzle of an ink jet printer.

[0005]

[Problem(s) to be Solved by the Invention]However, when high speed operation of the printed

matter was carried out as mentioned above, the wind occurred with this run and there was a possibility that it might become impossible for the flight direction of the ink particles which fly from a nozzle to printed matter to perform exact printing in response to influence. In order for an ink jet printer to make ink particles and to make it blow off, it was used for viscosity by ink with the diluent, having made it small, after making ink particles adhere to the surface of printed matter, ink permeated printed matter with the diluent, the blot occurred, and there was also a problem that the color definition of printing worsened.

[0006] It aims at providing the printer by the ink jet printer which this invention is made in view of the above-mentioned point, and can eliminate the influence of a wind, can raise the accuracy of printing, and can moreover raise the color definition of printing.

[0007]

[Means for Solving the Problem] A printer by an ink jet printer concerning this invention, The ink jet printer A which prints to the printed matter 6, the printed matter 6, the sealing machine room 7 of the ink jet printer A which prints by accommodating the nozzle 1 at least, and the pressure reducing device 8 which decompresses inside of the sealing machine room 7 are provided.

[0008]

[Function] In order [of the printed matter 6 and the ink jet printer A] to print accommodating the nozzle 1 in the sealing machine room 7 at least, and decompressing the inside of the sealing machine room 7 with the pressure reducing device 8 moreover, In the sealing machine room 7 where it is in a reduced pressure state, and air becomes thin even if high speed operation of the printed matter 6 is carried out, it is hard to generate a wind, A possibility of receiving the influence by a wind disappears, and the vapor rate of the diluent of ink can be promoted in the sealing machine room 7 of a reduced pressure state, desiccation of ink can be sped up, and a blot of ink can be prevented.

[0009]

[Example] This invention is explained in full detail according to an example below. As an ink jet printer, it is what can use arbitrary things, such as an electrification deviation type ink jet printer, It is preferred by making a single tier arrange in parallel the nozzle [a large number (there is also a case of the 1000 maximum numbers)] 1 especially in this invention, and accommodating in the casing 11 to use the ink jet printer which formed the head A of the multi-nozzle type like drawing 2 (a). The head A of this multi-nozzle type ink jet printer is arranged above the feed gear 18 used as a conveying table. The feed gear 18 is formed by the motors 19, such as a pulse motor, on the band conveyor 20 by which a running drive is carried out, and the head A of the multi-nozzle type ink jet printer is arranged so that the running direction of the band conveyor 20 and the parallel direction of the nozzle 1 may cross at right angles. Although the gutter 5 is arranged along with the slanting lower part of the head A in the example of drawing 2 (a), it may be made to store the gutter 5 in the casing 11 of the head A.

[0010]Drawing 2 (b) shows a theoretic structure of an electrification deviation type ink jet printer, and has illustrated it only about the one nozzle 1 dedicated in the head A. An electrifying electrode and 4 are deflecting electrodes oscillation electrodes, such as a piezo-electric element to which 12 gives vibration to the nozzle 1 in drawing 2 (b), and 3, and the electrifying electrode 3 and the deflecting electrode 4 are accommodated in the casing 11 of the head A. The electrifying electrode 3 is formed in the head A corresponding to each nozzle 1 arranged in parallel, and can also form this electrifying electrode 3 as pin electrodes. [many] And the ink sump 13 is connected to each nozzle 1 arranged in parallel in the head A, and it is made to be supplied from the ink sump 13 in the ink 14 at the nozzle 1. If it is in this thing and the ink 14 is supplied to the nozzle 1, when the ink particles 2 which turn into the ink particles 2, blow off from the nozzle 1 continuously in an operation of the oscillation electrode 12, and blow off from the nozzle 1 continuously will pass the electrifying electrode 3, you make it charged selectively. Namely, the ink particles 2 which pass the electrifying electrode 3 when the on-off control of the electrifying electrode 3 is carried out and the electrifying electrode 3 is made one are electrified, When the electrifying electrode 3 is made to turn off, it is made to have electrified the ink particles 2 selectively, as the ink particles 2 which pass the electrifying electrode 3 are not electrified. And when each ink particle 2 passes through between the deflecting electrodes 4, a flying locus is deflected and the electrified ink particles 2. Will not deviate, but will go straight on, the ink particles 2 from which the flying locus was deflected are caught by the gutter 5, and the reuse of the ink particles 2 which have not been charged is collected and carried out to the ink sump 13, The ink particles 2 which are not deflected but go straight on will not be caught by the gutter 5, but will reach even the printed matter 6, such as a printed wired board.

[0011]In the sealing machine room 7 formed in a sealed box etc., the head A which accommodates the nozzle 1 of the above-mentioned ink jet printer, and the feed gear 18 are allocated, as shown in drawing 1, and the pressure reducing device 8 further formed in the sealing machine room 7 with a vacuum pump, a plate fan, etc. is connected. The entrance 7a and the exit 7b which can be closed so that airtightness may be maintained at the anterior part and the rear of the sealing machine room 7, respectively are provided, The printed matter 6 which performs printings, such as a printed wired board, opens the entrance 7a, and supplies and sets it in the feed gear 18, and the printed matter 6 which printing ended opens the exit 7b, and enables it to have taken it out from the feed gear 18.

[0012]As the ink 14 used for an ink jet printer, Solvent dilution type thermosetting resin ink, UV curing type resin ink, etc. are common, and have diluted the ink 14 in the range of 30 to 90 weight section, using organic solvents, such as MEK, ethyl alcohol, methyl alcohol, butanol, and acetone, as a solvent. Although thermosetting resin, such as an epoxy resin, acrylate resin, phenol resin, a urea resin, melamine resin, and polyimide resin, is used as main resin of

the ink 14, it is also possible to use thermoplastics, such as vinyl acetate resin and an acrylic resin. Resin is blended in the range of five to 50 weight section. 5-20 weight-section combination of colorant, such as paints and a color, the bulking agent, etc. can also be carried out as other solid content, and the amount part addition of the electrostatic property grant agent of several [-fold] can also be carried out further if needed.

[0013]After in carrying out a deer and printing on the surface of the printed matter 6, such as a printed wired board, using the band conveyor 20 of the feed gear 18 as a table, laying it horizontally on it like drawing 2 (a) and setting the printed matter 6, the inside of the sealing machine room 7 is decompressed with the pressure reducing device 8. A decompression degree is suitably set up according to the performance of the pressure reducing device 8, the decompression time-of-onset, required energy, and printing quality demanded, etc., and its range of 750mmHg - 50mmHg is preferred. Since states, such as a spark, will be caused by decompression in an electrification deviation type ink jet printer if electrification pressure is high or deflecting voltage is high, it needs to be based also on this and it is necessary to set up a decompression degree.

[0014]And by making it run the band conveyor 20 with constant speed by the motor 19, The printed matter 6 is passed for the lower part of the head A of a multi-nozzle type ink jet printer with constant speed, In this case, the ink particles 2 are made to blow off from each of all the nozzles 1 which were arranged in parallel and provided in the head A continuously, [many] Some ink particles 2 carry out switch control of the electrifying electrode 3, and electrify it, and the gutter 5 is made to catch them by deflecting a flying locus with the deflecting electrode 4 among the ink particles 2 which blow off from each nozzle 1. Other ink particles 2 carry out OFF control of the electrifying electrode 3, and make it not electrify it, and as it is not influenced by the deflecting electrode 4, they make it go straight on, and they make this ink particle 2 made to go straight on arrive at the surface of the printed matter 6. Thus, by electrifying selectively the ink particles 2 which carry out the on-off control of the electrifying electrode 3 of each nozzle 1, and blow off from each nozzle 1, It is what can choose the ink particles 2 which reach the printed matter 6, and can choose the adhering position of the ink particles 2 to the printed matter 6, By making the ink particles 2 adhere to the printed matter 6 selectively in this way, it can print by a desired character and sign, and a pattern, moving the printed matter 6 to the head A with the feed gear 18. Namely, by making the ink particles 2 which blow off from each nozzle 1 of the head A while moving the printed matter 6 to an arrow direction with constant speed, as shown in drawing 3 (a) thru/or (f) adhere to the surface of the printed matter 6 selectively, It can print by a desired character and sign, and a pattern. As for the diameter of ink discharge of each nozzle 1, it is preferred to make it the size of the ink dot to which it is set as 30-150 micrometers, and the printed matter 6 adheres set to 0.1-0.3 mm, and, as for oscillating frequency, it is preferred to set it as 20-200 kHz.

[0015]As mentioned above, in order it is in charge of printing with an ink jet printer, and to perform this printing, decompressing the inside of the sealing machine room 7 with the pressure reducing device 8 moreover in the sealing machine room 7, Even if high speed operation of the printed matter 6 is carried out by the feed gear 18, in the sealing air chamber 4 to which it is in a reduced pressure state, and air is thin, it is hard to generate a wind, and it can print, without receiving the influence by a wind. Therefore, it is lost that the flight direction of the ink particles 2 which fly to the printed matter 6 is influenced by the nozzle 1 in the head A by a wind, the ink particles 2 can be made to be able to reach the printed matter 6 in the exact position made into the purpose, and accurate printing can be performed. The vapor rate of the diluent of the ink 14 will be promoted in the sealing machine room 7 in a reduced pressure state, Desiccation of the ink 14 adhering to the surface of the printed matter 6 can be sped up, the ink 14 can be prevented from spreading in the printed matter 6 by osmosis of a diluent, and the color definition of printing can be raised.

[0016]Although it enables it to print the printed matter 6 in the example of above-mentioned drawing 2 (a) by forming more greatly than the width dimension of the printed matter 6 the print width size (arrangement width dimension of the nozzle 1) of the head A of a multi-nozzle type ink jet printer only by letting the bottom of the head A pass once, When the print width size of the head A is smaller than the width dimension of the printed matter 6, it can print by sending so that it may let the printed matter 6 pass under the head A again after moving the head A crosswise which intersects perpendicularly with the feed direction of the printed matter 6 by the feed gear 18. For example, it can print all over the printed matter 6 by moving the head A 12 times right-angled to the feed direction of the printed matter 6, and carrying out reciprocation moving of the lower part of the head A for the printed matter 6 at about 600 mm, when the print span according [the width dimension of the printed matter 6] to the head A is 50 mm. Thus, when printing moving the head A right-angled to the feed direction of the printed matter 6, the total distance of a run of the printed matter 6 which passes the bottom of the head A becomes very long. For example, if it prints moving the head A 12 times as mentioned above when the length of the feed direction of 1 of printed matter is 600 mm, the total distance of a run of the printed matter 6 which passes the bottom of the head A will be set to $600 \text{ mm} \times 12 = 7200 \text{ mm}$. Therefore, although it is necessary to set the travel speed of the printed matter 6 as the high speed about [100 m] a part for /in this case, and to improve the productivity of printing, As mentioned above, since it is decompressed and is hard to generate a wind, even if the inside of the sealing machine room 7 sends the printed matter 6 in this way at high speed, it can prevent the influence of a wind.

[0017]Although it is made to print by sending the printed matter 6 with the feed gear 18, and moving the printed matter 6 relatively to the nozzle 1 of an ink jet printer in the example of drawing 2 (a), it may be made to move the nozzle 1. In that the ink 14 becomes easy to come

out from the nozzle 1, and load becomes small since the inside of the sealing machine room 7 is decompressed, although it is desirable, since it becomes difficult to stop the ink 14 in the nozzle 1 conversely, The type ink jet printer like drawing 2 (b) which breathes out the ink 14 continuously from the nozzle 1 is preferred. In this case, it is necessary to decompress the course which collects the ink 14 from the gutter 5 to the ink sump 13 with a degree of vacuum higher than the inside of the sealing machine room 7.

[0018]By printing in the sealing machine room 7 which is in a reduced pressure state as mentioned above, Since the ink 14 can be prevented from promoting the vapor rate of the diluent of the ink 14, speeding up desiccation, and spreading in the printed matter 6 by osmosis of a diluent, The selection range of the solvent used as a diluent can be made large, and the safe solvent selection with few public nuisances is attained. In this invention, since the shape of the ink dot which a blot is lost in this way and made to adhere to the printed matter 6 will be in the state of a perfect circle, it becomes easy to be able to print by the stable picture and to print by the still thicker ink layer at the overprint of an ink dot. In order to print in the sealing machine room 7 in a reduced pressure state, the printing ground of the printed matter 6 is stabilized and it can print by being stabilized in the printed matter 6 with various surface state and shape. Since a deviation succeeds even if it becomes possible to prevent them from fine ink particles dispersing on the surface of the printed matter 6 as a satellite, and furthermore adhering to it and makes late discharge speed of the ink particles 2 from the nozzle 1, Even when printing so that between the particles of the ink particles 2 may be overlapped, scattering by the collision of the ink particles 2 in the surface of the printed matter 6 can be prevented, and a printing surface can be finished finely.

[0019]

[Effect of the Invention]The ink jet printer in which this invention prints to printed matter as mentioned above, Since printed matter, the sealing machine room of an ink jet printer which prints by accommodating a nozzle at least, and the pressure reducing device which decompresses the inside of a sealing machine room are provided, It can print without being hard to generate a wind in the sealing machine room where it is in a reduced pressure state, and air becomes thin, and receiving the influence by a wind, even if high speed operation of the printed matter is carried out.

The accuracy of printing can be raised.

In the sealing machine room of a reduced pressure state, the vapor rate of the diluent of ink can be promoted, desiccation of ink can be sped up, and it can print vividly by preventing a blot of ink.

[Translation done.]

Family list

1 application(s) for: JP6182980 (A)

1 PRINTING DEVICE DUE TO INK JET PRINTER

Inventor: ARAI TAKAFUMI

Applicant: MATSUSHITA ELECTRIC WORKS LTD

EC:

IPC: B41J2/01; B41J2/01; (IPC1-7): B41J2/01

Publication JP6182980 (A) - 1994-07-05

Priority Date: 1992-12-22

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Classification:

- international: B41J2/01; B41J2/01; (IPC1-7): B41J2/01

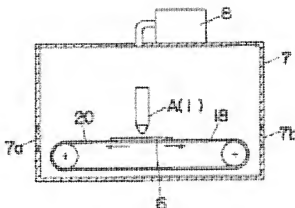
- European:

Application number: JP19920342247 19921222

Priority number(s): JP19920342247 19921222

Abstract of JP 6182980 (A)

PURPOSE: To enhance printing accuracy and printing sharpness by eliminating the effect of a wind. **CONSTITUTION:** A printing device is constituted of an ink jet printer applying printing to a material 6 to be printed, a hermetically closed printing chamber 7 receiving the material to be printed and at least the nozzle 1 of the ink jet printer to perform printing and a vacuum device 8 reducing the pressure in the hermetically closed printing chamber 7. A wind is hard to be generated in the hermetically closed printing chamber 7 held to a thin air vacuum state and the possibility receiving the effect of a wind is eliminated. The evaporation speed of the diluent of ink is accelerated in the hermetically closed printing chamber 7 held to a vacuum state to make it possible to accelerate the drying of the ink and the blur of the ink can be prevented.



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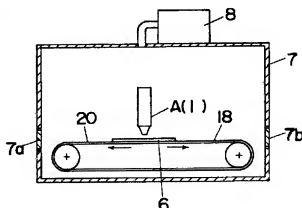
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【54】【発明の名称】 インクジェットプリンターによる印刷装置

【57】【要約】

【目的】 風の影響をなくして印刷の精度を高める。また印刷の鮮明度を高める。

【構成】 被印刷物6に印刷をおこなうインクジェットプリンター。被印刷物6とインクジェットプリンターの少なくともノズル1とを収容して印刷をおこなう密閉印刷室7。密閉印刷室7内を減圧する減圧装置8。これらを具備して印刷装置を形成する。減圧状態にあって空気が希薄になる密閉印刷室7内には風が発生し難く、風による影響を受けるおそれなくなる。また減圧状態の密閉印刷室7内ではインクの希釈剤の蒸発速度が促進されてインクの乾燥を進めることができ、インクの滲みを防止することができる。



1…ノズル

6…被印刷物

7…密閉印刷室

8…減圧装置

【特許請求の範囲】

【請求項1】 被印刷物に印刷をおこなうインクジェットプリンターと、被印刷物とインクジェットプリンターの少なくともノズルとを収容して印刷をおこなう密閉印刷室と、密閉印刷室内を減圧する減圧装置とを具備して成ることを特徴とするインクジェットプリンターによる印刷装置。

【発明の詳細な説明】

【0001】

【産業上の利用分野】 本発明は、プリント配線板などへのインクジェットプリンターによる印刷装置に関するものである。

【0002】

【従来の技術】 プリント配線板や電子部品等の被印刷物の表面に製品番号やロット番号、会社シンボルマーク、ケアーマーク等を印刷したり、あるいはこれらの表面にレジストや、導電ペーストや、無電解メッキの核などを印刷したりするにあたって、従来はスクリーン印刷によっておこなうのが一般的である。しかしスクリーン印刷の場合にはスクリーンの製版が必要であり、少量多品種生産の場合にもこのような製版をおこなうと作業効率が悪くなったりコスト高になったりする等の問題がある。

【0003】 そこで本出願人によって、インクジェットプリンターを用いて被印刷物の表面に印字することによって印刷をおこなうことが提案されている。インクジェットプリンターによれば、版を用いる必要なくコンピューターへの入力データに応じた任意の文字等で印刷をおこなうことができるものである。しかもインクジェットプリンターはインク粒子をノズルから被印刷物の表面に飛行させて付着させることによって印刷をおこなうものであるために、ワイヤードットプリンターなどのように被印刷物の表面に衝撃を与えることがなく、また表面に多少の凹凸があっても支障なく印刷することができるために、表面に回路を形成したプリント配線板などの被印刷物に印刷する装置として最適である。

【0004】 インクジェットプリンターで印刷をおこなう場合、インクジェットプリンターのノズルに対して相対的に被印刷物を高速で走行させて移動させることによって、被印刷物の全面にノズルをスキャンさせる必要がある。

【0005】

【発明が解決しようとする課題】 しかし上記のように被印刷物を高速走行させると、その走行に伴って風が発生して、ノズルから被印刷物へと飛行するインク粒子の飛行方向が影響を受けて、正確な印刷をおこなうことができなくなるおそれがあった。また、インクジェットプリンターはインクを粒子にして噴出させるために、インクは希釈剤で粘度を小さくして使用されており、インク粒子を被印刷物の表面に付着させた後に希釈剤によって被印刷物にインクが浸透して滲みが発生し、印刷の鮮明度

が悪くなるという問題もあった。

【0006】 本発明は上記の点に鑑みてなされたものであり、風の影響をなくして印刷の精度を高めることができ、しかも印刷の鮮明度を高めることができるインクジェットプリンターによる印刷装置を提供することを目的とするものである。

【0007】

【課題を解決するための手段】 本発明に係るインクジェットプリンターによる印刷装置は、被印刷物6に印刷をおこなうインクジェットプリンターAと、被印刷物6とインクジェットプリンターAの少なくともノズル1とを収容して印刷をおこなう密閉印刷室7と、密閉印刷室7内を減圧する減圧装置8とを具備して成ることを特徴とするものである。

【0008】

【作用】 被印刷物6とインクジェットプリンターAの少なくともノズル1とを密閉印刷室7内に収容し、しかも減圧装置8で密閉印刷室7内を減圧しながら印刷をおこなうようにしているために、被印刷物6が高速走行されても減圧状態にあって空気が希薄になる密閉印刷室7内には風が発生し難く、風による影響を受けるおそれなくなり、また減圧状態の密閉印刷室7内ではインクの希釈剤の蒸発速度が促進されてインクの乾燥を速めることができ、インクの滲みを防止することができる。

【0009】

【実施例】 以下本発明を実施例によって詳述する。インクジェットプリンターとしては、帯電偏向型インクジェットプリンターなど任意のものを用いることができるものであり、本発明では特に、多数（最大数千個の場合もある）のノズル1を一列に並列させてケーシング11内に収容することによって、図2（a）のようにマルチノズルタイプのヘッドAを形成したインクジェットプリンターを用いるのが好ましい。このマルチノズルタイプインクジェットプリンターのヘッドAは搬送テーブルとなる送り装置18の上方に配置してある。送り装置18はパルスモーターなどのモーター19によって走行駆動されるベルトコンベア20で形成してあり、マルチノズルタイプインクジェットプリンターのヘッドAはノズル1の並列方向がベルトコンベア20の走行方向と直交するように配置してある。図2（a）の実施例ではヘッドAの斜め下方に沿ってガター5が配置してあるが、ガター5はヘッドAのケーシング11内に収めるようにしてもよい。

【0010】 図2（b）は帯電偏向型のインクジェットプリンターの原理的な構造を示すものであり、ヘッドA内に納められた一つのノズル1についてののみ図示してある。図2（b）において12はノズル1に振動を与えるピエゾ素子などの発振電極、3は帯電電極、4は偏向電極であり、帯電電極3や偏向電極4はヘッドAのケーシング11内に収容してある。帯電電極3はヘッドA内に

多数並列される各ノズル1に対応して設けられるものであり、またこの帯電電極3はピン電極として形成することもできる。そしてヘッドA内に並列された各ノズル1にはインク溜め13が接続してあって、インク溜め13からノズル1にインク14が供給されるようにしてある。このものにおいて、インク14がノズル1に供給されると発振電極12の作用でインク粒子2となってノズル1から連続的に噴出されるものであり、ノズル1から連続的に噴出されるインク粒子2が帯電電極3を通過する際に選択的に帯電させるようになっている。すなわち帯電電極3はオン・オフ制御されており、帯電電極3をオンさせたときに帯電電極3を通過するインク粒子2を帯電させ、また帯電電極3をオフさせたときに帯電電極3を通過するインク粒子2は帯電させないようにして、インク粒子2を選択的に帯電させるようにしてある。そして各インク粒子2が偏向電極4間を通過する際に、帯電されたインク粒子2は飛行軌跡が偏向されると共に、帯電されていないインク粒子2は偏向されず直進することになり、飛行軌跡が偏向されたインク粒子2はガター5に捕捉されてインク溜め13に回収して再使用され、偏向されず直進するインク粒子2はガター5で捕捉されずプリント配線板などの被印刷物6にまで到達することになる。

【0011】上記のインクジェットプリンターのノズル1を収容するヘッドAと、送り装置18は密閉ボックス等で形成される密閉印刷室7内に図1に示すように配設しており、密閉印刷室7にはさらに真空ポンプやプレートファンなどで形成される減圧装置8が接続してある。密閉印刷室7の前部と後部にそれぞれ気密を保つように閉じることができる入り口7aと出口7bが設けてあり、プリント配線板など印刷をおこなう被印刷物6は入り口7aを開いて送り装置18に供給してセットし、印刷が終了した被印刷物6は出口7bを開いて送り装置18から取り出すことができるようにしてある。

【0012】また、インクジェットプリンターに用いられるインク14としては、溶剤希釈タイプの熱硬化性樹脂インクや、UV硬化型樹脂インクなどが一般的であり、溶剤としてMEK、エチルアルコール、メチルアルコール、ブタノール、アセトン等の有機溶剤を用いて30～90重量部の範囲でインク14を希釈するようにしてある。インク14の主たる樹脂としてはエポキシ樹脂、アクリレート樹脂、フェノール樹脂、ユリア樹脂、メラミン樹脂、ポリイミド樹脂等の熱硬化性樹脂が使用されるが、この他に、酢酸ビニル樹脂やアクリル樹脂などの熱可塑性樹脂を使用することも可能である。樹脂は5～50重量部の範囲で配合されている。その他の固形分として顔料や染料等の着色剤、充填剤等を5～20重量部配合することもでき、さらに必要に応じて帯電性付与剤を数重量部添加することもできる。

【0013】しかして、プリント配線板などの被印刷物

6の表面に印刷をおこなうにあたっては、被印刷物6を図2(a)のように送り装置18のベルトコンベア20をテーブルとしてその上に水平に載置してセットした後、密閉印刷室7内を減圧装置8で減圧する。減圧度は減圧装置8の性能や、減圧開始時間、必要エネルギー、要求される印刷品質などに応じて適宜設定されるものであり、750mmHg～50mmHgの範囲が好ましい。帯電偏向型インクジェットプリンターでは帯電圧が高かったり偏向電圧が高かったりすると、減圧によってスパーク等の状態が引き起こされるので、これも踏まえて減圧度を設定する必要がある。

【0014】そして、モータ19でベルトコンベア20を一定速度で走行させることによって、マルチノズルタイプインクジェットプリンターのヘッドAの下方を一定速度で被印刷物6を通過させ、この際に、ヘッドA内に多数並列して設けた総ての各ノズル1からインク粒子2を連続的に噴出させ、各ノズル1から噴出されるインク粒子2のうち一部のインク粒子2は帯電電極3をオン制御して帯電させると共に偏向電極4で飛行軌跡を偏向させることによってガター5に捕捉させる。また他のインク粒子2は帯電電極3をオフ制御して帯電されないようにすると共に偏向電極4の影響を受けないようにして直進させ、この直進させたインク粒子2を被印刷物6の表面に到達させる。このように各ノズル1の帯電電極3をオン・オフ制御して各ノズル1から噴出されるインク粒子2を選択的に帯電させることによって、被印刷物6に到達するインク粒子2を選択することができ、被印刷物6へのインク粒子2の付着位置を選択することができるものであり、送り装置18でヘッドAに対して被印刷物6を移動させながらこのように被印刷物6にインク粒子2を選択的に付着させることによって、所望の文字や記号、パターンで印刷をおこなうことができるものである。すなわち図3(a)乃至(f)に示すように、被印刷物6を矢印方向に一定速度で移動させながらヘッドAの各ノズル1から噴出されるインク粒子2を選択的に被印刷物6の表面に付着させることによって、所望の文字や記号、パターンで印刷をおこなうことができるものである。尚、各ノズル1のインク吐き出し径は30～150μmに設定して被印刷物6に付着されるインクドットのサイズが0.1～0.3mmになるようにするのが好ましく、また発振周波数は20～200kHzに設定するのが好ましい。

【0015】上記のように、インクジェットプリンターで印刷をおこなうにあたって、この印刷は密閉印刷室7内において、しかも減圧装置8で密閉印刷室7内を減圧しながらおこなうようにしているために、送り装置18によって被印刷物6が高速走行されても、減圧状態にあって空気が希薄になっている密閉空気室4内には風が発生し難く、風による影響を受けることなく印刷をおこなうことができる。従ってヘッドA内のノズル1から被印

印刷6へと飛行するインク粒子2の飛行方向が風で影響を受けることがなくなり、目的とする正確な位置において被印刷物6にインク粒子2を到着させて精度の良い印刷をおこなうことができるものである。また減圧状態にある密閉印刷室7内ではインク14の希釈剤の蒸発速度が促進されることにより、被印刷物6の表面に付着したインク14の乾燥を速めることができ、希釈剤の浸透によってインク14が被印刷物6に滲むことを防止することができるものであり、印刷の鮮明度を高めることができるものである。

【0016】上記図2(a)の実施例では、マルチノズルタイプインクジェットプリンターのヘッドAの印字幅寸法(ノズル1の配列幅寸法)を被印刷物6の幅寸法よりも大きく形成することによって、被印刷物6をヘッドAの下を一度通すだけで印刷できるようにしているが、ヘッドAの印字幅寸法が被印刷物6の幅寸法よりも小さい場合には、ヘッドAを送り装置18による被印刷物6の送り方向と直交する幅方向へ移動させた後に被印刷物6を再度ヘッドAの下に通すように送ることによって、印刷をおこなうことができる。例えば、被印刷物6の幅寸法が約600mmで、ヘッドAによる印刷幅が500mmの場合には、被印刷物6の送り方向に対して直角にヘッドAを12回移動させて被印刷物6をヘッドAの下方を往復移動させることによって、被印刷物6の全面に印刷をおこなうことができる。このように被印刷物6の送り方向に対して直角にヘッドAを移動させながら印刷をおこなう場合、ヘッドAの下を通過させる被印刷物6の走行の総距離は非常に長くなる。例えば被印刷物6の1の送り方向の長さが600mmであるときに上記のようにヘッドAを12回移動させながら印刷をおこなうと、ヘッドAの下を通過させる被印刷物6の走行の総距離は600mm×12=7200mmになる。従ってこの場合には被印刷物6の走行速度は100m/分程度の高速に設定して印刷の生産性を高める必要があるが、上記のように密閉印刷室7内は減圧されていて風が発生し難いため、このように高速で被印刷物6を送っても風の影響を未然に防ぐことができるものである。

【0017】また、図2(a)の実施例では送り装置18で被印刷物6を送ってインクジェットプリンターのノズル1に対して相対的に被印刷物6を移動させることによって印刷をおこなうようにしているが、ノズル1を移動させるようにしてもよい。さらに、密閉印刷室7内が減圧されているために、ノズル1からインク14が出易くなって負荷が小さくなるという点では好ましいが、逆にノズル1内にインク14を停止させることが難しくなるので、ノズル1から絶えずインク14を吐き出す図2(b)のよなタイプのインクジェットプリンターが好ましい。この場合、インク14をガター5からインク溜め13に回収する経路は密閉印刷室7内よりも高い真空度で減圧しておく必要がある。

【0018】尚、上記のように減圧状態にある密閉印刷室7内で印刷をおこなうことによって、インク14の希釈剤の蒸発速度を促進して乾燥を進め、希釈剤の浸透によってインク14が被印刷物6に滲むことを防止することができるために、希釈剤として使用する溶剤の選定範囲を広くすることができるものであり、より公害の少ない安全な溶剤選定が可能になるものである。また本発明では、このように滲みがなくなって被印刷物6に付着させるインクドットの形状が真円の状態になるために、安定した画像で印刷をおこなうことができるものであり、さらにインクドットの重ね印刷で厚いインク層で印刷することが容易になるものである。また減圧状態にある密閉印刷室7内で印刷をおこなうために、被印刷物6の印刷下地が安定し、表面状態や形状がまちまちの被印刷物6に安定して印刷をおこなうことができるものである。さらに被印刷物6の表面に細かいインク粒子がサテライトとして飛散して付着することを防止することが可能になり、またノズル1からのインク粒子2の吐き出し速度を遅くしても偏向がうまくいくので、インク粒子2の粒子間を重複するように印刷する場合でも、被印刷物6の表面でのインク粒子2の衝突による飛散を防ぐことができ、印刷面を綺麗に仕上げるができるものである。

【0019】

【発明の効果】上記のように本発明は、被印刷物に印刷をおこなうインクジェットプリンターと、被印刷物とインクジェットプリンターの少なくともノズルとを収容して印刷をおこなう密閉印刷室と、密閉印刷室内を減圧する減圧装置とを具備するので、被印刷物が高速走行されても減圧状態にあって空気が希薄になる密閉印刷室内には風が発生し難く、風による影響を受けることなく印刷をおこなうことができるものであり、印刷の精度を高めることができるものである。また減圧状態の密閉印刷室内ではインクの希釈剤の蒸発速度が促進されてインクの乾燥を進めることができるものであり、インクの滲みを防止して印刷を鮮明におこなうことができるものである。

【図面の簡単な説明】

【図1】本発明の一実施例の概略断面図である。

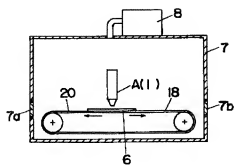
【図2】本発明の一実施例を示すものであり、(a)は一部の斜視図、(b)はマルチノズルタイプのインクジェットプリンターのヘッドの断面図である。

【図3】マルチノズルタイプのインクジェットプリンターによって印刷がおこなわれる手順を示すものであり、(a)乃至(f)は一部の概略平面図である。

【符号の説明】

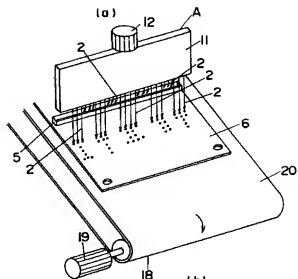
- 1 ノズル
- 6 被印刷物
- 7 密閉印刷室
- 8 減圧装置

【図1】



- 1…ノズル
6…被印刷物
7…密閉印刷室
8…減圧装置

【図2】



【図3】

